

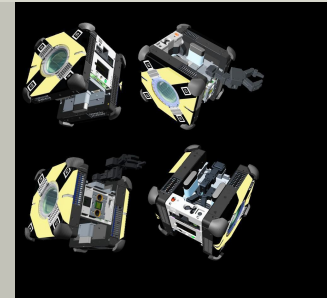


Project Introduction

Astrobee is a free flying robot for inside the ISS. It will be used by flight controllers for doing mobile sensing and camera tasks. It will replace SPHERES to be used by researchers for 0g robotics testing.

Anticipated Benefits

Today, astronauts on the ISS not only conduct science activities, but they also perform a variety of tasks required for ISS housekeeping and in-flight system maintenance. Astrobee can off-load tasks that are routine, repetitive or simple but long-duration work, such as conducting environment surveys or taking sensor readings. Flight controllers at MCC can use Astrobee as a mobile camera in order to improve ground situation awareness during crew activities without requiring crew time to reposition fixed cameras. As a research platform, Astrobee enables developers of space technologies to test in microgravity in a benign environment that can even include human intervention, if necessary. will save crew time by reducing the time needed to manually search for equipment. Benefits to Other Government Agencies: Experience and lessons learned from the development and operation of Astrobee will benefit other agencies that have requirements for free-flying space robots. For example, DARPA is currently formulating a "GEO Robotics" program that will develop a robot to perform satellite servicing in geostationary orbit. Such a robot could reuse subsystems, particularly software modules (operator interface, ground data system, etc) and software architecture, from Astrobee. Benefits to the Commercial Space Industry: This item does not benefit the commercial space industry. Benefits to the Nation: As a micro-gravity robotics research facility on ISS, Astrobee will enable students, academic researchers, and private industry to test new robotics technology in microgravity. For example, in 2015, NASA awarded several SBIR Phase grants to small businesses to develop lightweight robot manipulator arms for use in space. When complete, these arms could be tested with Astrobee. In addition, Astrobee will be fully capable of supporting education and public outreach activities, such as robotic competitions, in the same way that SPHERES has done so since 2006.



The Astrobee free flyer (clockwise from upper left): front face, right propulsion module and bottom payload bays; left propulsion module, top payload bay, and perching arm deployed; top payload bay with perching arm stowed; aft...

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Primary U.S. Work Locations and Key Partners

Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
● International Space Station(ISS)	Supporting Organization	NASA Program	
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Space Technology Research Grants(STRG)	Supporting Organization	NASA Program	

Primary U.S. Work Locations

California	Texas
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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Game Changing Development

Project Management

Program Director:

Mary J Werkheiser

Program Manager:

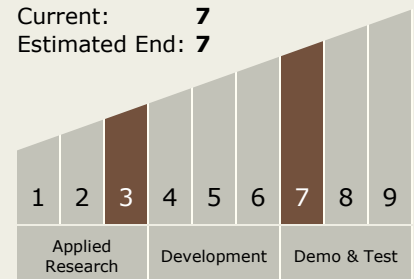
Gary F Meyering

Principal Investigator:

Maria G Bualat

Technology Maturity (TRL)

Start: **3**
Current: **7**
Estimated End: **7**





Project Transitions



October 2014: Project Start



October 2019: Closed out

Closeout Summary: The goal of the Astrobee was to develop free-flying robot technology that would be capable of performing intravehicular autonomous operations on the International Space Station ISS. Stakeholders included the ISS SPHERES Facility, the SPHERES Working Group, and HEOMD Advanced Exploration Systems program. The project designed and built five robotic free flyers with autonomous vision-based navigation and path mapping guidance hardware and software systems with payload off-loading capability. Supporting technology developments included a propulsion system, proximal and remote robot user interface, administrative software controls, and payload interface hardware. Two prototype units were used for ground development and operation validation testing, and three additional units were certified for flight and delivered to the ISS. The Astrobee robots will complement astronaut tasks and offer significant potential to perform a variety of tasks, including routine, repetitive or simple but long-duration work, such as conducting environment surveys, taking sensor readings or performing routine maintenance. The Astrobee project was transitioned to the Advanced Exploration Systems program in October 2019.

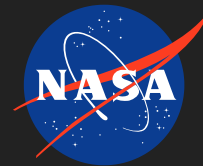
Technology Areas

Primary:

- TX04 Robotic Systems
 - └ TX04.2 Mobility
 - └ TX04.2.3 Small-Body and Microgravity Mobility

Target Destinations

Earth, The Moon



Images



Astrobee.jpg

The Astrobee free flyer (clockwise from upper left): front face, right propulsion module and bottom payload bays; left propulsion module, top payload bay, and perching arm deployed; top payload bay with perching arm stowed; aft face including docking interface and perching arm deployed.

(<https://techport.nasa.gov/image/143243>)

Links

Astrobee Project Page
(<https://www.nasa.gov/astrobee>)

Project Website:

https://www.nasa.gov/directorates/spacetech/game_changing_development/index.html